flying

SAFETY

OCTOBER 1987

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THERE I WAS

■ Some years ago, I was set up to fly a T-38 day/night out-and-back sortie. At the very last minute, the scheduler changed my student to one who had been having trouble with instruments, and with whom I had not flown before. After a hasty briefing, we were out the door. Destination was an Air Force base in the southeast.

The first leg was uneventful, and the weather was good. After strapping in for the return leg, Clearance Delivery advised us our clearance had been lost. It was very dark when we were finally ready to go again.

During the climbout, Center had us level off at FL 230. It had been clear over the field, but we were now in the clouds, and with isolated thunderstorms in the area, it was not the kind of place to be with a T-38. I was coordinating with Center for an expedited climb when I heard a highpitched voice from the front seat inform me, "SIR, THE PITOT BOOM IS ON FIRE!!"

While this revelation sank in, I noticed the front canopy was growing an interesting shade of lavender-green. Seconds later, as Center cleared us for the climb that would put us above the clouds, a bolt of lightning lit up the surrounding sky.

I took control of the airplane and started an afterburner climb to our new altitude. The plane was climbing very nicely, which was fine with me, and to which I attributed the use of afterburner. Then it happened . . .

Almost simultaneously with exiting the tops of the clouds at FL 300, I felt that sensation so common to T-38 drivers — the "tickle." A quick glance at the angle of attack indicator showed it pointing to .6.

Now the whole story was clear to me. I had been able to climb so well because the pitot tube had iced up while in the clouds. At the instant of that revelation and its implication that I was much slower than the .9 Mach showing on the airspeed indicator, there were two little pops, and it got very dark and very quiet.

As we nosed over and went back into the clouds, I got a call off to Center and directed the student to get out his flashlight and prepare for the checklists. The airspeed indicator dropped to zero, and I had only the dimly lit turn and slip and an unwinding altimeter.

For many seconds, the only sounds from the front seat were grunts and groans as the student tried to remember where he had stowed his flashlight. Then, once found, many more seconds passed while he tried to find the appropriate checklist. During this time, I kept having visions of ejecting successfully, only to be eaten by alligators.

Passing 15,000 feet and growing impatient at his inability to find the checklist, I directed the student to shut off the throttles, and I restarted the engines without it. An uneventful recovery was made to our departure base. The entire flight had taken less than 20 minutes.

On reflection, I believe there are several points worth pondering.

■ *Don't assume.* In the debrief, the student claimed he had never been taught to use the pitot heat, so it never occurred to him to turn it on. I had wrongly assumed he had. In all the excitement, I had not directed him to turn it on.

■ *Don't rush the briefing.* How many times have you heard this one? But it is still true — a few minutes of briefing might save some gray hairs.

■ *Where's the flashlight?* Is your flashlight somewhere you can get at it in a hurry if you have to? The regs require it for a reason, and it may keep you from becoming a late-night snack for alligators. ■

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SPECIAL FEATURES

REGULAR FEATURES

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Oh no, not another article about . . .

THE HAZARDS OF WINTER FLYING

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ No! It can't be October again, but all indications suggest otherwise. The kids are back in school, the trees are taking on a golden brown, mowing the lawn has all but ceased with the old mower ready for a winter break, and *Flying Safety* magazine is publishing another article on winter flying. What new information could they possibly have this year?

Well, the answer is NONE! (Don't stop reading just yet or you could find yourself the subject of next October's edition.) No, winter flying has not changed significantly since last year, or forever, for that matter. But on the other hand, we also continue to experience mishaps with winter weather cause factors.

Probably the most notorious winter weather crash occurred in January 1982, when an Air Florida Boeing 737 crashed immediately after takeoff from Washington's National Airport. Aside from the significance of the loss of life associated with this mishap, even more disturbing was the crew's total lack of understanding and concern about the environment in which they attempted operation.

Before you continue, test your knowledge of winter operations and take the following short quiz.

1. How long is chemical deicing considered effective?
2. How much snow and ice accumulation is allowed on the lifting surfaces of your aircraft? . . . and the control surfaces of your aircraft?
3. For aircraft equipped with exhaust pressure ratio (EPR) indications, what will result if the aft pressure source becomes clogged with snow and ice?
4. When air traffic control issues a braking action report of POOR, what corresponding RCR value is used to determine ground operating distances?
5. What is the difference between anti-icing and deicing equipment, and which type of equipment is installed on your aircraft?

Since our 1986 winter weather review, we have experienced seven reported mishaps with winter-type weather cause factors, including one Class B mishap. Some of these included:

- A C-5B departed the runway during landing after the crew failed to reference the RCR Crosswind Correction Chart, and landed with an RCR of 06 and approximately an 8-knot crosswind component.
- A C-141B taxiing on an ice-covered surface lost all traction and slid into a snowbank.
- A T-37 experienced a flameout after a fuel control is suspected to have succumbed to extreme cold.
- An A-10 suffered damage to both the No. 1 and No. 2 engines after the engines ingested ice during flight.
- A C-21A hydroplaned off a runway while attempting a takeoff on a slush-covered runway.
- A C-23 experienced a jammed elevator after slush collected on the control surface and was allowed to freeze.
- An F-5 experienced a flameout of the No. 2 engine after the engine ingested ice.
- Two B-1Bs experienced engine damage after the engines ingested ice.

The key to safely operating in inclement winter weather conditions is a sound understanding of both your and your aircraft's limitations and a thorough weather briefing. Your base or en route forecaster will provide indepth weather information, but the aircrew must be capable of effectively using this information. (What does an RSC of IR08P DRY mean?)

Hazards Associated with Winter Flying

Structural Icing. AFM 51-12, *Weather for Aircrews*, tells us there are two primary types of icing — structural and induction. Structural icing occurs when free air and aircraft surface temperature are below freezing and supercooled visual water droplets are present. Temperatures between 0 degrees C and −40 degrees C are most conducive to structural icing; however, serious icing is rare with temperatures below −20 degrees C. At these temperatures, clouds are composed completely of ice crystals.

Clear structural icing normally occurs when the temperature range is 0 degrees C to −10 degrees C, but can be encountered with cumulonimbus clouds to temperatures as cold as −25 degrees C. Clear icing is normally associated with cumuloform type clouds and can cover a wing, resulting in restricted control surface movement and loss of lift.

Rime structural icing normally occurs when the temperature range is 0 degrees C to −20 degrees C, but can occur with temperatures as cold as −40 degrees C. Rime icing normally attaches to the leading edges of the aircraft and can alter the flow of air over the wing. This type of icing is easily removed and is normally associated with stratoform type clouds.

Induction Icing. Induction icing is most common in the air induction system, but may also be found in the fuel system (carburetor icing). Induction icing can form in clear air when relative humidity is high and free air temperatures are +10 degrees C or colder.

Induction icing can be a serious problem in the air and on the ground. This is especially true in Europe where these weather conditions are common. There have been documented cases of foreign object damage (FOD) to engines caused by ice during maintenance ground runs. The ice can form on or in the intake as well as on the engine intake guards. As the ice builds up, it can break off and be ingested by the engine and cause extensive damage.

Rime icing is a milky, opaque, granular deposit that normally forms on the leading edges. However, it can cover the entire wing. Its rough surface can seriously distort airflow.

Aircrews and maintenance crews both must be aware of this hazard and be prepared. Use appropriate Dash 1 procedures and established maintenance practices to ensure we don't lose an engine or an aircraft due to induction icing.

Snow. Snow presents various hazards to flight, some affecting the crew while some affect the operation of the aircraft.

Whiteout. Whiteout is a visibility-restricting phenomenon that occurs in polar regions when a uniformly overcast layer of clouds overlies a snow or ice-covered surface. The parallel rays from the sun are broken up and diffused when passing through the cloud layer so they strike the snow-covered surface from many angles. This diffused light reflects back and forth countless times between the snow and clouds until all shadows are eliminated. The result is a loss of depth perception, and low level flight and landings on snow surfaces become dangerous.

Arctic Haze. Aircrews in flight over polar regions sometimes experience reduced visibility in the horizontal and in looking at surface objects at an angle other than from directly above. (Sound like fog?) Color effects suggest that extremely small ice particles cause this condition, which is also called arctic mist near the ground.

continued

Flying over a snow-covered landscape can be a beautiful experience. Not so beautiful is the induction icing you can encounter in clear air if the conditions are right.

Hazards of winter flying continued

Fog. Fog limits takeoffs and landings in the polar regions more than any other visibility restrictions.

Ice Fog. Ice fog, a major operational hazard, is common in polar areas in winter. It forms in moist air during extremely cold weather. Ice fog affecting aircraft operations most frequently is produced by combustion of aircraft fuel in air −20 degrees F (−29 degrees C) and colder.

With supersaturated conditions, routine aircraft engine runup or movement can supply enough exhaust impurities and moisture to cause sublimation. The resulting ice fog may restrict visibilities enough to halt aircraft operations at the airfield for hours.

Blowing and Drifting Snow. Blowing snow is a greater hazard to flying operations in polar regions than in mid-latitudes because the snow is dry and fine and can be picked up easily by light winds. Winds may raise the snow 1,000 feet off the ground and produce drifts more than 30 feet deep, causing objects, such as runway markers, to become obscured. Under certain conditions, a frequent and sudden increase in surface winds may cause visibility to drop from unlimited to near zero within minutes. Blowing snow may be deceptive to the inexperienced crewmember since the shallowness of the snow layer may permit good visibility above the snow at the same time the horizontal visibility within the layer is very poor.

Temperature Inversion. During the winter, temperatures in polar areas may increase from −60 degrees F at the surface to 0 degrees F only 1,500 feet above the ground. Strong temperature inversions, like this, will dramatically decrease the climb performance of an aircraft. Anticipate them, and be alert when the weather forecaster briefs the magnitude of the inversion. Then follow procedures listed in your flight manual for cold weather operation.

Altimeter Errors. Strong winds over rough terrain and much-below standard temperatures, which are common in the polar regions, are sometimes responsible for large errors in altimetry. Knowing the cause and effect of these errors and understanding them will help the crewmember avoid hazards they present. Aircrews should allow for an ample margin in selecting flight altitudes over mountainous terrain. More information on this problem can be found in AFM 51-12, Chapter 4.

Summary

Operations in winter conditions can be safe if aircrews remember their limitations and the limitations of their aircraft. Avoid icing conditions whenever possible. The biggest danger caused by ice accumulation is reduced aerodynamic efficiency of the aircraft. Specifically, ice accumulation may have the following effects:

- High takeoff, landing, and stall speeds.
- Reduced climb capability.
- Increased power requirement, thus increasing fuel consumption and decreasing range and endurance.
- Impaired control response.
- Reduced engine performance caused by obstructing the engine inlet.

The other hazards which have been addressed must be handled on a case-by-case basis, and sound judgment and thorough knowledge

All fliers are familiar with the hazards associated with fog. But, do you know when and where to expect it? How about ice fog?

Thorough planning is especially important during the winter season due to fast moving fronts and rapidly changing weather conditions.

Polar regions sometimes experience strong temperature inversions near the ground. This can seriously degrade your aircraft's climb performance. Make sure you're aware of and plan for this situation before takeoff.

will prevail every time. While on the subject of knowledge, how did you do on our little quiz?

1. Most authorities agree that chemical deicing fluid applied correctly will remain effective for 30 minutes. Care must be taken not to apply the fluid in areas around an operating auxiliary power unit or on some of our synthetic windshields and canopies.

2. The amount of accumulation of ice and snow allowed on the aircraft varies for each aircraft and should be referenced in the aircraft's operating manual. The C-141B, for example, may be operated with no more than 1/8th inch snow or frost on the lifting surfaces; however, no accumulation is allowed on the control surfaces.

3. A clogging of the aft pressure source will result in an inflated EPR indication for any given power setting. This is one of the suspected causes of the Boeing 737 crash previously described. While the crew set what they believed to be takeoff power, a reference of other engine instruments would have shown lower-than-expected indications, and should have told the crew they had not achieved takeoff power.

4. Conversion of braking action reports to RCR equivalents is described in Section B of the Flight Information Handbook. General conversions are as follows:

RCR	Braking Action
02-05	Nil
06-12	Poor
13-18	Fair (Medium)
19-25	Good

In many Air Force publications, a braking action of Good=23 (dry), Fair=12 (wet), Poor=6 (icy), and Nil=0. Again, a check of your specific operating manual may provide additional information on this subject.

The runway surface condition of "IR08P DRY" decodes to ice on the runway, RCR 08 Patchy, remainder of runway dry.

5. As the names infer, anti-icing equipment is used to prevent the accumulation of ice on the aircraft, while deicing equipment is used to eliminate ice accumulations after they have formed on the aircraft. Most aircraft use an engine anti-icing system (C-130, KC-135, F-4, C-9, to name a few) while some aircraft use deicing equipment on tail surfaces (C-9 and C-141, for example).

To repeat one last time — a combination of sound judgment and thorough knowledge will contribute to safe and effective winter operations. ■

A drag chute can be a big help in slowing an aircraft on a slippery surface. If necessary, the barrier cable can provide a very quick way to stop.

When in doubt . . .
SHOUT IT OUT!

MAJOR PHILLIP T. SIMPSON
Directorate of Aerospace Safety

■ When was the last time you were about to do something really dumb and another crewmember kept you from doing it? Maybe you forgot to put your gear down, or you didn't compute power correctly, and someone else caught it before it caused a problem.

Chances are it has happened to most of us at one time or another. That's one of the good deals about flying with a crew. There is always someone around to help keep you out of trouble. In fact, we depend on the other person helping us just as much as he or she depends on us helping him or her. That is part of what crew coordination is all about.

At least, this is how it is supposed to work but, unfortunately, it doesn't happen that way all of the time. Over the past few years, there have been many instances where an aircraft was being flown into a hazardous condition, but no one spoke up to stop it, even though they may have had time to do so.

I'm sure there are some fancy psychological explanations why this happens, but I wouldn't know what they are. I do know, however, that people tend to think the other person must know what he or she is doing, otherwise why do it? Although the mishaps discussed here deal mostly with helicopters, this attitude can probably be found in just about every type of aircraft. Look around and see if you can spot it the next time you fly.

A few years ago a helicopter was conducting a night, over-water mission. During the mission, the crew had to establish their position and set up a holding pattern. After spotting a light on the water's surface, the aircraft commander started an approach to get a closer look. As the approach progressed, the aircraft was flown into a condition of zero airspeed with insufficient power applied to stop the descent. Although the other crewmembers monitored the approach, they did not advise the pilot to recover and go around until it was too late. The aircraft impacted the water and rolled over.

Had the crew known what the outcome of that approach was going to be, they certainly would have taken action to stop it. However, they assumed for too long that the pilot knew what he was doing when, in fact, the pilot himself did not know he had lost control until it was too late to recover.

A high percentage of helicopter mishaps do occur during the approach and landing phase, and this is when all crewmembers must get involved to make sure the approach is being flown properly. During an approach to a remote site pad, an aircraft commander allowed the aircraft to go below his intended flightpath. Both the copilot and the flight engineer were monitoring the approach, and both had a good view of the intended landing site. The flight engineer stated later that shortly before impact he felt they were not going to make it to the pad, but he said nothing to the crew. The relatively inexperienced copilot said he wasn't sure what his actual duties were, so he didn't say anything either. Both crewmembers had an opportunity to advise the pilot that the approach wasn't looking too good, but neither did, and the aircraft impacted the ground short of the pad and rolled over.

Although you might expect an inexperienced copilot to sit through a bad approach, you will find that it has happened to experienced pilots as well. While preparing for an approach to a remote site pad, the crew incorrectly computed their power requirements and didn't realize they were flying the helicopter into a condition that exceeded its capabilities.

While other crewmembers did make suggestions to increase the margin of safety, the pilot continued on, and no one pressed the issue. The copilot, a fully qualified flight examiner, only watched as the pilot flew the aircraft through a deteriorating approach and on into the power deficient condition. The aircraft landed short of the pad on a steep slope and rolled over. In this case, the crew did express concern about the safety of the approach, but no one took that final step of calling for a go-around.

A C-130 copilot and navigator certainly wish they had taken that step during a landing being made by an experienced pilot. He had allowed the aircraft to drift off the centerline on final and did a number of S-turns trying to get realigned. During one pass over the runway, he decided it was time to land, so he planted it hard about 2,000 feet past the approach end. The gear collapsed, and the aircraft slid to a stop on the runway.

Afterwards, both the copilot and navigator said the landing should have been aborted, but they had confidence in the pilot and thought he could get down OK, so they didn't say anything. The pilot said he knew the landing wasn't looking too good, and if someone had said something, he would have taken it around. The crew was certainly polite, but they sure didn't help each other much.

So what does all this mean? Well, for one thing, it means the Air Force has lost both people and airframes because nobody spoke up when they should have. Sure, it's easy to sit here and point out what could or should have been done differently, and these crewmembers must have had reasons for their lack of action.

It's tough to tell someone you think they are doing something unsafe, especially when you might feel that person knows more than you or is a better pilot than you. Would I risk challenging a pilot more experienced than myself if I thought it was going to prevent a mishap? With me in it? You bet I would! And I'm sure it does happen quite often out there. Unfortunately, we seldom hear about the mishap that didn't happen because someone was smart enough to stop the operation when it needed stopping.

All mishaps are preventable in one way or another. These kinds of mishaps are even more preventable than most because they don't require reg changes, tech order changes, aircraft mods, new procedures, hours of practice, staff studies, or even luck. To prevent these mishaps, all we need is you. "When in doubt, shout it out!" ■

TAC's *New Look*

CMSGT AUGUST W. HARTUNG AND PEGGY E. HODGE
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When we visited the Tactical Air Command (TAC), we found behind their much-improved mishap rate and maintenance statistics, a new and more efficient way of doing business. This includes restructured and streamlined maintenance and supply programs, as well as an increased emphasis on people programs. Since these new ideas mean success for TAC, perhaps there may be lessons here for all of us as we read about "TAC's New Look."

— Ed.

The mission of TAC is to organize, train, equip, and maintain combat-ready forces capable of rapid deployment and employment as well as to ensure strategic air defense forces are ready to meet the challenges of peacetime air sovereignty and wartime air defense. But without highly qualified, dedicated maintenance people, even the most sophisticated weaponry will not provide the deterrent force necessary for this nation to remain at peace.

Realizing this, TAC implemented a number of changes during the last 6 to 7 years to provide for high sortie generation, and to do it safely. This article focuses on three areas: The command's method of maintaining aircraft, their people programs, and the big payoff of this revamped philosophy.

Maintaining Aircraft

Combat Oriented Maintenance Organization. Let's first look at the business of maintaining aircraft.

Since TAC's requirement is to "fly the way we would have to fight," the command concluded in the late 1970s that the traditional centralized concept of maintenance didn't give the best potential for high sortie generation or quick deployment. The result was that TAC developed and tested a new maintenance concept called Combat Oriented Maintenance Organization (COMO). The goal is simple — produce quantities of operationally ready aircraft to fly high sortie rates, and do it under conditions that will be similar to actual combat conditions.

■ **Organizational Patterns.** Before the implementation of COMO, TAC operated like the rest of the Air Force under the centralized maintenance concept. The basic organization provided for the crew chief to be on the flightline while supervisors and specialists were in office and support shops. When required on a job, specialists would be dispatched to the aircraft, and afterwards return to the shop. It was a system that is still used by some commands, but TAC needed a different approach.

Since TAC deploys at a squadron level, rather than with complete wings, something new was needed. That something new turned out to be COMO, or the decentralized maintenance concept. In contrast to a wing organized under the centralized maintenance concept with four aircraft maintenance squadrons, a wing using COMO has three: Aircraft Generation, Component Repair, and Equipment Maintenance.

The Aircraft Generation Squadron's (AGS) jobs include launch, recovery, servicing, and the type of flightline maintenance characteristic of "on equipment" work necessary for producing sorties.

The Component Repair Squadron's (CRS) job is to fix components, such as avionics boxes, hydraulic pumps, and engines that are taken off flightline aircraft and brought to the CRS repair shops. Also included is fuels system maintenance.

The Equipment Maintenance Squadron does the heavy maintenance, phase inspections, and tasks that normally require hangaring the aircraft. Their responsibility also extends to munitions storage, base flight, fabrication shops, aerospace ground equipment, and transient alert activities.

To provide unit autonomy, there is a further breakdown of these organizations. For example, the AGS is subdivided into branches called aircraft maintenance units (AMU), one for each operational squadron of aircraft. Each AMU consists of between 150 and 300 people. This dedicated group of crew chiefs and specialists maintains specific aircraft, and along with their fighter squadron pilots, forms an inviolate combat team. If the 426th Tactical Fighter Training Squadron moves from its home base with the 405th Tactical Fighter Training Wing at Luke AFB, its own aircraft and AMU go with the deployment. The maintainers know their aircraft well from their day-to-day experience, and there is a much closer rapport between the ground and flight crews. The AMUs are provided the people, material, and authority that enables them to generate high sortie rates in peace or war to meet specific unit requirements.

TAC's alert commitment is vital to its defense role. Here an F-15 from the 48th Fighter Interceptor Squadron prepares to scramble.

Simplified, the COMO concept means everybody assigned to an AMU stays busy helping the sortie generation effort. There is much task training to enable cross-utilization of skills. Radar technicians are often able to fuel or tow aircraft, environmental system folks help change engines, engine mechanics change tires and lend a hand with the jacking. It's work done on the flightline, between sorties, and is one of the keys to TAC's COMO concept.

Before COMO, about 75 percent of the sortie-producing maintenance people could be found in the specialty shops, working on items brought to them to be fixed. Now, 75 percent of those same people are out on the flightline, contributing to TAC's exceptionally favorable fix rates and high sortie production rates.

■ **Two Shift Operation.** TAC implemented a two-shift aircraft maintenance operation. Even though

continued

In TAC, there is tremendous opportunity for personal identification between technicians and the aircraft on which they work.

A maintenance crew from TAC's 6th Airborne Command and Control Squadron, Langley AFB, Virginia, prepares an EC-135 aircraft for jacking. This unit provides airborne command, control, and communications support worldwide.

TAC units earn higher efficiencies because specialists are part of a squadron-level deployment package.

TAC's *New Look*

continued

many maintenance tasks can be accomplished on a single shift by an individual or team, a certain percentage of them have to be passed from one shift to the other. In the past, TAC employed the three-shift concept, consisting of the day, swing, and midnight crews, in any 24-hour period. But through studies, the command realized that people, by nature, had a habit of deferring maintenance and passing it on to the next shift. Major General Henry Viccellio, TAC's Deputy Chief of Staff for Logistics, explained it this way, "We found with the traditional three-shift operation a greater amount of information had to be transferred from one shift to the next, and sometimes with it, there was a greater chance for a lapse of information — a lapse that could lead to mistakes and even mishaps."

So, TAC decided on a two-shift operation, consisting of a day and swing, or night, crew. But they didn't stop there. The command next created a measure of merit called the "fix rate" to track the percentage of aircraft breaks fixed within 2-hour intervals, ranging from 2 to 12 hours. Since a typical maintenance shift is 8 hours, the greatest attention is paid to the 8-hour figure.

"The goal is simple — not only to keep our airplanes ready, but to minimize the amount of deferred maintenance — maintenance that's passed from one shift to another," explained General Viccellio. "Maintenance gets done more quickly, and it gets done with integrity, with continuity, and with proper documentation. Our goal was faster fixes, safer fixes, better fixes . . . for combat readiness and for safety, and the psychology behind this emphasis has paid off well for us."

Combat Oriented Supply Organization. We all know "you can't fly without supply," and for that reason, TAC has taken a tremendous step forward by marrying supply with maintenance. As an added feature to COMO, a program called combat oriented supply organization (COSO) was integrated into the maintenance organization. This break with tradition has paid off handsomely for the command in many ways. By assigning supply people to the AMUs and by placing most spare aircraft parts close to the flightline, there are tremendous time savings in getting the parts to those responsible for fixing jets. Prior to the implementation of COSO, aircraft parts delivery averaged well over an hour, and often ran as high as 3 or 4 hours. Now, TAC maintainers average less than 10 minutes in picking up those spare assets from the flightline parts store.

Still other goals are set to reduce repair cycle times of line replacement units and other shop repairables, while special levels are established on items that may be hard to obtain through normal depot or vendor channels. In short, there is an obvious interface between maintenance and supply and the managers at the depot repair facilities.

People

Goals and Standards. Since the implementation of COMO, goals and standards have been paramount in everything TAC does with flying airplanes. When asked about this program, General Viccellio saw it as a tremendous contribution to the TAC success story. "Goals and standards have really paid off big for us," the general remarked. "They help us take our mission, which is 'fly and fight,' and in a visible, objective way enable everyone to understand his or her contribution toward that mission."

Although there are thousands of people, including active duty, reservists, and guardsmen, who wear the TAC patch on their uniform, they are not lost in the broad goal of "fly and fight." The reason is simple. Each wing, squadron, branch, section, and flight has its individual goals and standards posted clearly for all to see. Everyone understands what his or her contribution is to the overall mission, and can measure that contribution to the goals and standards they develop as a team. Knowing what is expected and then measuring actual output against those expectations has become a tremendous feedback tool to everyone in the maintenance business.

TAC's method of maintaining aircraft and their people programs lead to high sortie generation.


More airplanes are now available to fly sorties at higher rates than before, without an increase in the number of maintenance man-hours per week.


Routine training for turnaround tasks has changed to reflect the needs of the new system. This has enhanced the command's ability to deploy anywhere at any time to protect our nation's interests.

"Understanding and meeting goals and standards have promoted maintenance integrity, a sense of competition, an intense pride, and of course, what we're most proud of — productivity," explained General Viccellio. "We can reliably generate our airplanes, we can sustain high sortie rates, and we can do it consistently and safely."

New Look. In addition to the revamped maintenance and supply programs, TAC tackled one of the toughest problems for any command: Improvement of facilities. These "Look" programs, as they are

Cross-utilization of maintenance skills is a contributing factor in TAC's 30 percent increase in its mission-capable rate since 1980.

Each wing, squadron, branch, section, and flight throughout TAC has its individual goals and standards clearly posted for all to see.

Understanding and meeting goals and standards have contributed to an intense pride throughout the command.

known in the command, have not only enhanced the living areas of TAC's workforce, but especially the working areas. The TAC philosophy is simple: If people feel good about their work area, they will perform their work better and safer. Through a tremendous amount of self-help projects, ranging from large wall murals reflecting unit history and mission to in-house snack bars in the work centers, pride of the maintenance workforce is obvious. Hangar floors shine, office walls and shop work areas are covered with wood paneling and wallpaper, and unit goals are proudly displayed next to individual and organizational awards and trophies.

It becomes obvious to the casual visitor or newcomer to the command that "Look" programs have had a profound influence upon TAC's record-setting maintenance statistics. Colonel David Butler, TAC's Director of Maintenance Training and Management, summarized it this way: "Without a doubt, 'Look' programs have affected the command's readiness and combat capability because people are proud of what they're doing and where they're doing it."

The Big Payoff

Are COMO and COSO with the two-shift workday, goal setting, systematic training, and "Look" programs working? Without a doubt, they are working exceptionally well! There have been significant across-the-board improvements in aircraft turnaround times between sorties, mission capable rates (up almost 30 percent over 1980 rates), fix rates, and supply pickup times, while the major mishap rate has dropped over 50 percent since 1980.

"We've seen substantial improvement in our ability to safely maintain our airplanes and give them to the pilots in a condition that will allow them to be flown safely," said General Viccellio. "We're proud of that!"

General Viccellio explained the changes this way, "The quality of our maintenance has improved as much as the quantity of maintenance. To illustrate, I would point to our 3-year average mishap rate (expressed in the number of Class A mishaps per 100,000 flying hours), not only in TAC but in our TAC-gained units in the Air National Guard and Air Force Reserves. In 1980, the rate was in excess of 5. In fact, the 3-year average as you looked at it in 1980 was 5.7. Between 1980 and 1987, that rate has consistently decreased until we find ourselves at about 3.1 today.

"If we had continued to experience the mishap rate that faced us in the late 70s and early 80s, by 1987 we would have lost about 145 additional aircraft and 114 additional aircrews. Those numbers represent about two TAC fighter wing equivalents that we did not have to buy as replacements, or that we did not have to program for future buys.

"That's the kind of contribution that safety can make — not only to the health and morale of your people in the day-to-day environment, but to your combat capability as well. Quality maintenance, without a doubt, has been a tremendous part of this success story."

Routine training for maintenance people has also changed to reflect the needs of the decentralized concept. Cross-utilization is a way of life on the flightline, so that most of the specialists out with the airplanes can perform many tasks outside their own career field.

General Viccellio explained, "We do a lot of training for the overseas fighter commands. People come through our field training detachments and our on-base training system en route overseas. In our environment, training is an absolute priority. We want our people to be effective when they graduate from our courses and walk out on the flightline or go into the shop. And so we have made a big commitment in TAC toward getting that final polish, the specific knowledge that an individual needs to be an effective technician."

Additionally, there has been a very real, although intangible, payoff, and it has come in the area of personal identification with the aircraft and its mission. Throughout the command, TAC aircraft maintainers proudly identify with their units and aircraft. Crew chiefs' names are stenciled on the sides of fighters as prominently as the pilots' names.

The TAC maintenance force has come a long way in 7 years, and the future is just as exciting. It should be obvious that the programs discussed have had a profound influence upon TAC's way of doing business. Today, these ongoing programs are keys for the command to meet the increasingly sophisticated threat of the 1990s.

Finally, the bottom line is readiness to deploy quickly, fight immediately, and do it all safely. That's what TAC — or any part of our Air Force — is all about. ■

PRIORITY: Tactics or Survival?

MAJOR LINN L. VAN DER VEEN
Directorate of Aerospace Safety

■ If the USAF was trying to get you ready for only one big mission, you'd have been issued a white scarf with a big red sun on it — you know, one you wrap around your head when they seal you into the cockpit. In other words, when and if the balloon goes up, we have to get to the target, whether it's tanks, airfields, or airborne MiGs, and back, over and over again. So where does that fit in with the way you fly each day, the way you train yourself and others? Are you training to be tactical, or training to survive?

It's no big secret, I hope, but the way we train had better be *both* tactical and safe, because if the priorities are right, there is *no* difference! Sure, flying into the merge outnumbered three to one, or popping to blast an armored regiment defended by multiple SAMS and ZSU are inherently unsafe. But the approach to these missions, and of course, training for these missions, must coordinate the right mixture of tactical aggression and basic skills, or else we might as well issue that white scarf with the sun on it.

Every year, we lose good pilots and their aircraft when the desire to be "tactical" results in a disastrous misprioritization. Good tactics *start* with survivability. The same factors that result in the loss of aircrew and aircraft in peacetime will still be present during combat, so the first tactical priority must be a basic such as ground avoidance, midair collision avoidance, or good basic instrument flying. The biggest difference is there will be more distractions, more reasons to concentrate on something other than the highest priority — **SURVIVAL**.

Poor Tactics

Some recent examples of tactics that sounded good, but turned out bad:

- The wingman's reluctance to climb, caused by his desire to avoid detection at Red Flag, contributed to a midair between two A-10s attempting a low altitude cross turn.
- A pilot, flying a low altitude awareness training mission (LOWAT), flew into the ground after 130 degrees of a reaction turn as he watched the attacker pass overhead.
- A pilot making coordinated attacks with another two-ship flew into the ground watching the other aircraft as he pulled off target.
- A pilot, also flying LOWAT, flew into the ground during a check turn made to place his wingman in a perch position.

Did these pilots have their priorities right, or did their desire to successfully complete the tactical scenario temporarily become more important than clearing their flightpath for the ground and other jets? If we could ask them, they would all probably agree they never consciously placed mission over survival. However, the way they learned to be tactical allowed all of them to die, or nearly die, being tactical. For some reason, the desire to, for instance, stay low *and* check six override the number one priority at low level — ground avoidance.

Combat Experience

If you think these mishaps will be avoided in combat, prevented by an increased awareness or some other miracle cure, the British/Argentine combat experience during the Falklands War proved otherwise. Six of the first seven British aircraft lost during the conflict were noncombat losses. This total included three helicopters lost attempting to land in bad weather, and a midair collision as two Harriers maneuvered separately for an intercept at low altitude. The Argentines lost four aircraft that flew into the ground attempting to land or fly at low level in bad weather. For both sides, 16 percent (17 of 104 aircraft) were noncombat losses. The opposing forces learned early that even the best tactical plan would be unsuccessful unless basics like instrument flying and good lookout were successful first.

Too much emphasis on the wrong things during a mission can produce this result. The pilot unintentionally chose tactics over survival. Make sure you don't make the same choice.

Setting Priorities

I'll leave you with three conclusions about priorities in tactical situations. To start with the obvious — there's no peacetime mission more important than you and your jet. On the ground, everyone knows that, though — it's almost too basic to mention! The problem comes in the air, when tactics, mission objectives, pressure from flight members or a check ride, an emergency, etc., result in a pilot forgetting that basic rule. Our guys are not consciously placing tactics before survival, but they are still losing track of that number one priority. Some portion of the mission insidiously demands so much attention that the pilot or crew *allows* that mission element to become more important than life itself.

That leads to the second conclusion. If your tactics are so complicated that you or your wingman can't concentrate on things like ground avoidance or the position of other members of the flight, then you need to simplify. Use a building block approach to break your cosmic attacks or maneuvers down so they can be mastered in stages without sacrificing any basic aircraft control.

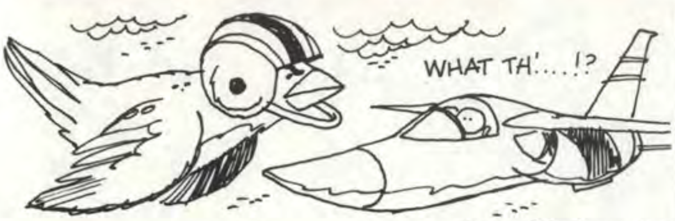
Thirdly, there's a problem that people wearing flight suits allow to exist and can cure themselves. The same pilot performed the first two examples of disastrous tactics listed earlier. On the same mission as the fatal ground impact, he was fouled for strafing below 75 AGL during the long range strafe portion of a "tactical" attack.

Survival First

Is there anyone in your unit hiding a lack of respect for the hazards of flight under the disguise of being "tactical?" Think about it — anyone in your flight or squadron who's usually the lowest in the low block, who regularly presses on bomb release, will do almost anything, including getting too low or passing uncomfortably close to a wingman, to make the tactics work? Maybe a young guy with great hands and an excellent future, the guy who will take any sortie, as long as he can go low and fast, hit the range, or have an opportunity to get at your "six." He might pick up a few more fouls than the rest of the squadron, may press the bubble a few times just to get that kill on film, and always pushes for one more set up, one more pass. Do you find yourself making allowances because he's "tactical?"

There's obviously a fine line between the aggressive attitude we want at the pointy end of our fighter and attack aircraft, and the *overaggression* that results in tactics taking priority over survival. Training programs, briefings, and debriefings must consciously stress survival as the first priority in every tactical plan. Supervisors and peers, especially flight leads and other flight members, must enforce this. If we forget the basics in peacetime in an attempt to better prepare for war, not only will we reach combat with fewer resources, but those remaining resources will be depleted faster due to noncombat losses. ■

OPS TOPICS



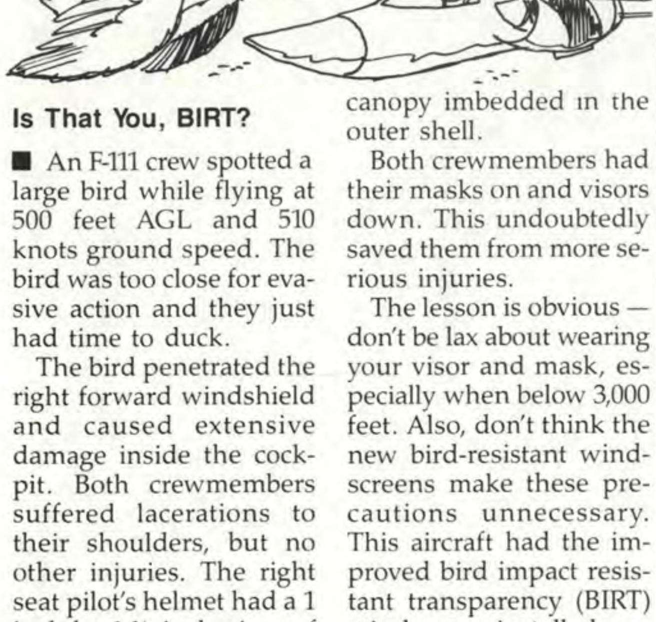
Is That You, BIRT?

■ An F-111 crew spotted a large bird while flying at 500 feet AGL and 510 knots ground speed. The bird was too close for evasive action and they just had time to duck.

The bird penetrated the right forward windshield and caused extensive damage inside the cockpit. Both crewmembers suffered lacerations to their shoulders, but no other injuries. The right seat pilot's helmet had a 1 inch by 1-½ inch piece of canopy imbedded in the outer shell.

Both crewmembers had their masks on and visors down. This undoubtedly saved them from more serious injuries.

The lesson is obvious — don't be lax about wearing your visor and mask, especially when below 3,000 feet. Also, don't think the new bird-resistant windscreens make these precautions unnecessary. This aircraft had the improved bird impact resistant transparency (BIRT) windscreen installed.



Tally Ho!

While flying a T-37 at an assigned 7,000 feet on a low altitude airway, the crew was given a traffic advisory. They were informed of opposite direction traffic at 12 o'clock and 3 miles at 7,000 feet.

The pilot immediately requested a traffic avoidance vector and climbed to 7,300 feet. The ATC controller twice called the other aircraft, a Cessna 172, to verify altitude, but did not issue the requested vector.

The pilot of the T-37 spotted the 172 at about 1 mile and maneuvered to the right. When clear, he descended back to 7,000 feet.

This is another case of a conflict between IFR and VFR traffic in which both pilots were right. However, if the T-37 pilot had not taken immediate corrective action, they might have been *Dead Right*! An IFR clearance does not guarantee separation from VFR traffic.

Lightning 2, Engines 0

During a night terrain following radar mission at 1,000 feet, a system flyup caused the F-111 to climb into heavy weather. The crew aborted the route and leveled at 16,000 feet. The aircraft passed between two thunderstorm cells and encountered heavy rain for 15 to 20 seconds. The crew then saw a flash of lightning and heard a loud bang.

The No. 2 engine smoothly rolled back to 60 percent RPM. Five seconds later, the No. 1 engine also rolled back to 60 percent RPM. Both generators remained on line. The WSO depressed and held the emergency airstart button while the pilot checked engine response. Neither engine would respond.

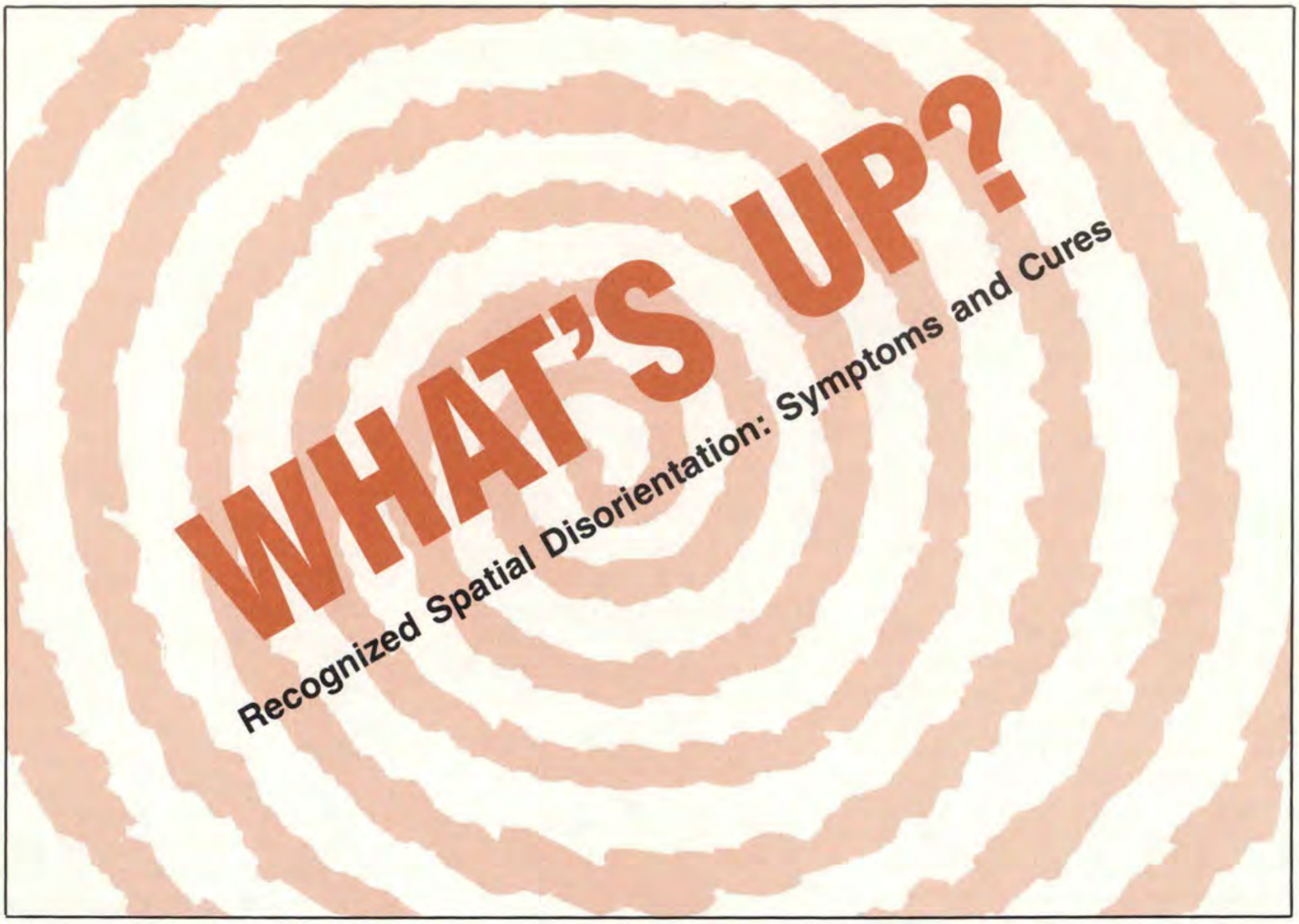
The pilot started a shallow descent to maintain 270 knots. The crew then shut down the No. 2 engine and used normal checklist procedures to restart it. They repeated the procedure for the No. 1 engine, and both engines recovered to normal operation. They recovered the aircraft at 11,000 feet (5,000 AGL) and returned to base for an uneventful landing.

Maintenance found significant hail damage to the aircraft, but no evidence of a lightning strike. They also found no engine damage or reason for the engine stalls.

The double engine stall was most likely caused by one or more of the following.

- Ingestion of extremely turbulent air associated with thunderstorms.
- Excessive water or hail ingestion.
- A lightning strike that disrupted the fuel control.

This incident should remind all fliers of the basic rule for flying in or near thunderstorms — *don't!* See "Avoid the Jolt From a Bolt," February 1987, *Flying Safety* for more information. ■



MAX M. WYMAN
Captain, USAFR

■ Spatial disorientation has presented countless problems, both mild and severe, through the years. Such disorientation is the result of one of the following:

- Inadequate sensory input.
- Incorrect sensory interpretation.
- Mental nonacceptance of sensory data in the other-than-conscious brain centers.

As pilots, we are more than familiar with the notes, warnings, and cautions demanded by such problems. However, the exceptional commitment demanded by combat flight, weapons system operations, and specialized mission requirements tends to overshadow recognized disorientation as remote and even benign. Using a different approach, we will re-examine the extreme dangers of recognized spatial disorientation and the few options available to combat it.

Disorientation in Action

Some years ago, I experienced a crippling form of spatial disorientation in an F-106 which should have resulted in the loss of the aircraft. The actual event was stimulated by asymmetric popping of my ears during a rapid IMC climb, or what is technically known as alternobaric vertigo.

My symptoms were nystagmus (involuntary oscillations of the eyeballs), tunnel vision, extreme faintness, an intense feeling of apprehension, and heavy, uncoordinated control of my hands, arms, and legs. These conditions were also coupled with what is informally known as temporal distortion — time seemed to slow down. The compound effect of the conditions prevented me from flying the aircraft.

Had the autopilot not coupled and functioned properly, I would have been forced to eject. During the time of my incapacitation, the aircraft traveled 25 nm at 350 KCAS, indicating approximately 4-½ minutes of pilot down time.

A note to maintenance people: At the time of this trouble, only 40 percent of the squadron's autopilots were functional — as this was the accepted fleet standard. Whoever the unknown airman was who bothered to fix mine is solely responsible for the safe return of the aircraft.

The events of that afternoon were not consistent with ground schools or training manuals. According to such teachings, disorientation symptoms had to fit nicely into illusion classifications. What I had experienced was neither an illusion nor an information misinterpretation, but an uncontrollable series of seemingly self-generated mental impairments.

Pilot Attitudes

When the story was told to fellow pilots, they were fully convinced there was something physically wrong with me that day — some

continued

kind of illness. The same invincible pilot attitude came up again during a safety meeting held after an F-5 was lost to "giant hand" illusion. The F-5 driver had an illness. After all, like my case, we were both aware that we were the victims of spatial disorientation, but neither of us had the mental composition or self-determined ability to overcome the problem immediately. By their judgment, we should have.

Disorientation and the Brain

To begin our discussion, we must understand that recognized spatial disorientation is strictly a result of conflicting mental processes in the brain and not incorrect data sensed by the vestibular, somatosensory (seat-of-the-pants), or visual systems. Sensory organs rarely fail to function properly.

The brain is a very complex instrument, with many levels of decision making — both conscious and other-than-conscious. The conscious mind is that region where we as individuals think, judge, and generally make decisions. Technically speaking, the region where our consciousness forms is called the reticular formation, a finger-like mat of neurons extending from the medulla to the mid-brain.

What must be understood is that this conscious center of the brain is a small fraction of the actual brain mass. Contrary to popular belief, the convolutions of the cerebrum gray matter are nothing more than a memory and logic network.

The reticular formation is still very much a mystery. Currently, it is believed the reticular formation receives inputs from the middle and lower brain centers, filters some inputs, while augmenting others, before passing them into the higher cerebrum gray matter. The results of any upper brain analysis then come back down in the form of responses and perceptions as viewed by consciousness.

Consciousness is supported by these higher order brain functions, but is neither created nor controlled by them. These other-than-conscious centers, no matter how developed, must receive information within a defined set of limits. The information must be believable and handled within established logic patterns.

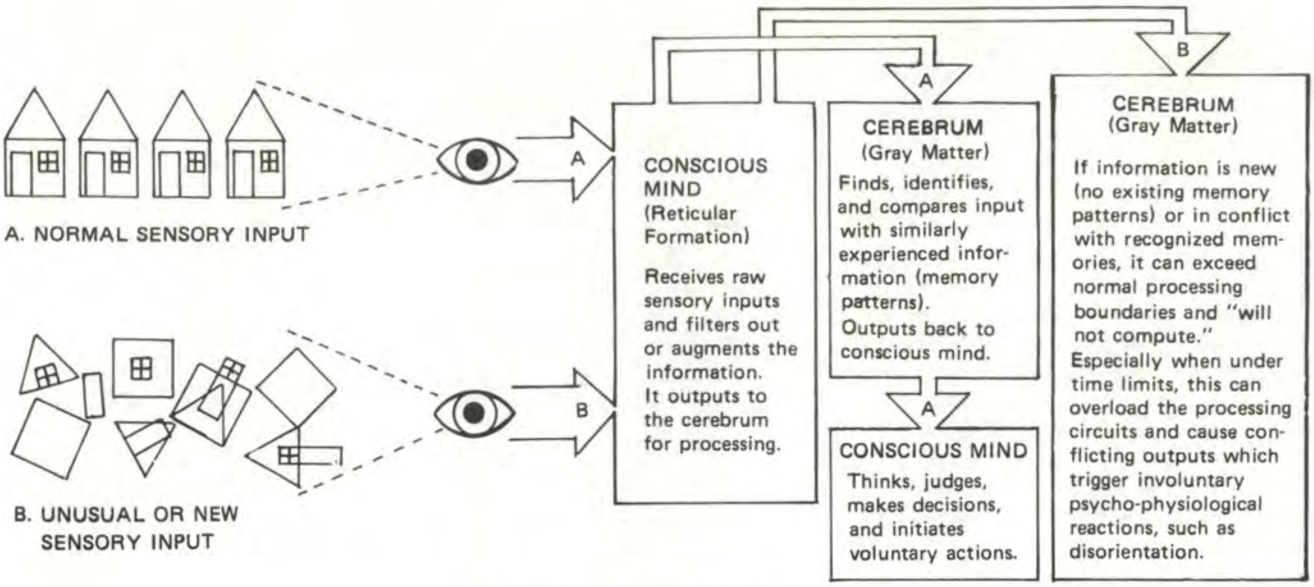
There exists an operating envelope which may be breached if sensory input information is inconsistent with learned and accepted patterns. Any disruption stems not from lack of conscious commitment, but from exceeding the design envelope of the logic system — inputting inconsistent information along unprepared paths.

Early Flight Responses

Take, for example, your first sorties in pilot training. The brain is in a foreign environment, and inconsistent information is passed through normal logic paths — unusual "g" forces, spinning, and turning. This unfamiliar information may be viewed by the logical brain as inconsistent. Just like a computer, if garbage is put in, the mechanism can only produce garbage. No matter how hard we consciously try, we cannot overcome or control the output of a mechanism receiving unfamiliar inputs.

Simple air sickness is nothing more than a mechanism response manifested by processing information with unacceptable inconsistencies. When such a mechanism response is tripped, there is nothing consciousness can do until we are conditioned to accept this new information, or the logic network develops sufficient answers to nullify

In the giant hand phenomenon, it seems as if one wing, the nose, or the tail, is being pushed down despite the pilot's best efforts to resist. In reality, it is the pilot's disoriented subconscious mind fighting his conscious mind which is seeing the instruments. The solution — fly with your fingertips. This involves a different neurological pathway than flying with the whole hand.



Information Processing By The Brain

the onslaught of sensory inconsistencies.

Experiencing sickness is not the only response which may be triggered by the puzzled logic mechanism of the brain. Depending on how much conflict exists between different other-than-conscious brain centers, an entire spectrum of mechanism responses may be generated. This spectrum may range from sickness through near incapacitation.

We are already familiar with some mechanism responses: "Giant hand" illusion, nystagmus, and simple air sickness. These are not singular individual problems of their own which fit nicely into chapters of books, but rather the more commonly displayed pieces of the spectrum.

Space Flight Responses

Another example occurs when an astronaut goes on the first orbital flight. Despite thousands of hours of flight time, test pilot school, and years of training, he or she will display a spectrum of mechanism responses.

For example, one of the more common responses occurs within the digestive tract. The individual feels fine, but if he or she drinks a glass of milk, it will go down and come right back up. The extent to which the tract is affected may be seen in the milk upon its return trip: No stomach acid, no normal body chemical interaction — in fact, no tainting of any kind. The milk is just as sweet and pure as before consumption.

The logical brain is so confused that entire organ systems are closed down. This is a common mechanism response — it is not the only response suffered by every astronaut every time. There is an entire spectrum of responses which may be triggered by the brain if it receives information that is conflicting or perceived to be inaccurate due to unfamiliarity. It is not a conscious selection and may not be outlined in AFM 51-37, *Instrument Flying*, or any other manual. The only thing we must know is that the response is not an illness, but a normal action of a logic network under duress.

Dealing with Disorientation

In my specific episode, when one ear popped and the other did not, the logical brain received confusing information. Initially I had no

continued

NASA Photograph

Dr Norman E. Thagard, STS-7 mission specialist, is actually performing a medical experiment although his appearance resembles an invading alien. Thagard, a medical doctor, was evaluating physiological reactions of astronauts in space travel.

symptoms, but I knew something was wrong. A conflict in the other-than-conscious brain had occurred.

Time seemed to slow, and I was able to think unusually fast. I engaged the autopilot. Now the various mechanism responses became visible: Nystagmus, fading of the senses, heavy limbs. I was totally conscious and totally against what was happening. Temporal distortion seemed to offer a linear expansion of apparent time division and thus time available for action, an extremely dangerous situation if accepted with any degree of complacency. In spite of total conscious awareness, time expanding temporal distortions and 2,000 first pilot/IP hours, I could not overcome these mechanism responses until the other-than-conscious brain received the answers it needed.

Only a small fragment of the brain holds our individual conscious abilities. The rest of the brain — the majority of the brain — is strictly a logic mechanism. If unacceptable information is fed in, one or several mechanism responses may result from information mismatch, false recognition, or exceeding learned environmental constraints.

Your consciousness cannot supply the required resolution to stop the conflict. You may consciously increase your instrument cross-check, but resolution will only be achieved when the rest of the brain receives sufficiently accurate nulling information. This will take time, and time will only be available if you can maintain an acceptable degree of aircraft control.

If you can't pass control to someone else and you are unable to operate and monitor the autopilot, there are no other options except to leave the aircraft. Other-than-conscious disorientation responses are a fact and, when they occur, there is absolutely nothing you can do to clear the situation except endure the symptoms, work your cross-check, and leave the aircraft when you can no longer control it. ■

Physiological Problem Flow Chart

CAPTAIN RANDALL S. FULTZ
USAF Hospital
Reese AFB, TX

■ There I was, a new C-141 aircraft commander, heading across the pond hoping for a good time in Europe. So far, nothing out of the ordinary had gone wrong until over the headset I heard, "Pilot, Load." "Go ahead," I said. "I've got a guy back here who says he's got some sort of tingling feeling in his hands."

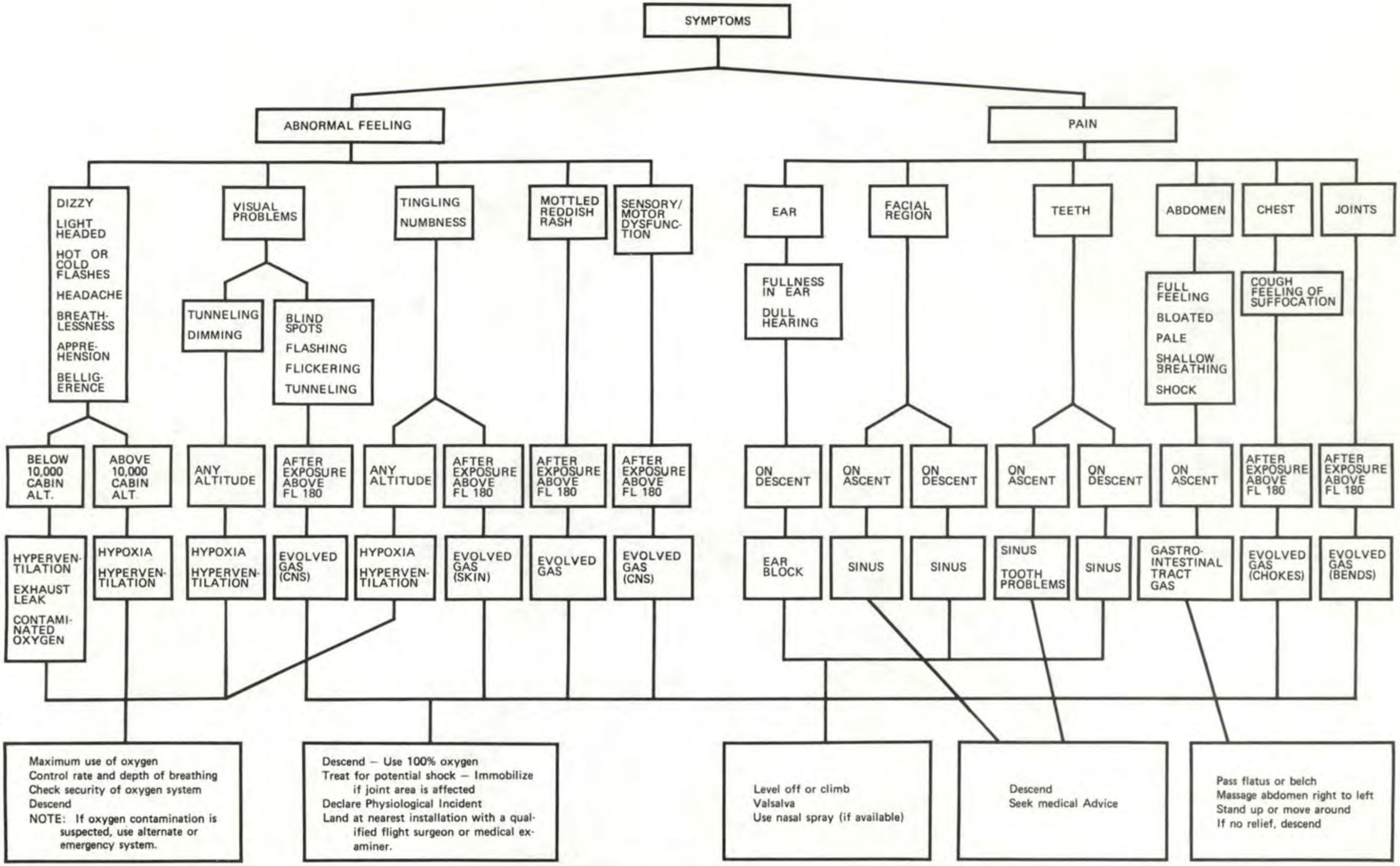
Simultaneously, the copilot and I looked at each other with a dumbfounded look and shrugged our shoulders. "What am I," I said, "a physiologist? Crew, this is the pilot. Does anybody remember any of that stuff from their last physiological training course?" What I got back was a resounding, "You've got to be kidding!"

Well, now I am a physiologist and thought it was time we had some sort of quick reference to figure out what was wrong if someone really did come down with those problems they tell us about during the refreshers. Being a flier and a strong believer of the KISS (keep it simple, stupid) method, I thought a flow chart would work best.

Usually, physiological problems will either involve some degree of pain or abnormal feeling. For example, if someone is feeling pain, go to that side of the chart. Next, determine where the pain is and continue down the line to when it occurred. Finally, drop down the chart to find out what the problem is and the treatment to be used. The same procedure applies to abnormal feelings.

Obviously, this information won't do you any good unless you have it available during flight. At our refresher classes, we pass out a chart to everyone and tell them to tuck it away somewhere. I suggest you make a copy of this one. I know most of you carry enough stuff already in your "personal checklist," but there have been times when I wished I had something like this. Especially, when the person with the problem was me. ■

PHYSIOLOGICAL PROBLEM FLOW CHART



NOTE: If any of these symptoms occur, check in with a flight surgeon after landing.

LOADING THE GUN . . . STACKING

SFC RONALD J. SKAMANICH
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■ Being in an unforgiving profession has taught us to investigate mishaps and seek knowledge in hopes that mistakes made by others will not be made again. We have also found out, through mishap investigations, that psychological factors influence human behavior and can contribute to the cause.

If we review a mishap that occurred over 40 years ago to one of our most famous fliers, Major Thomas B. McGuire, we can easily relate this incident to our current stress-filled world. Any person, no matter how good you think you really are, can be overloaded by mental, physical, and stressful events to the point of making a bad decision.

Thomas B. McGuire, Jr., was born on August 1, 1920, in Ridgewood, New Jersey, and at the time of his mishap, was assigned to the 5 AAF in New Guinea and the Philippines. Major McGuire was regarded as a true professional with exceptional skills in flying the P-38 Lightning.

Major McGuire's professionalism had been displayed often. When he wasn't flying, he would assist his ground crew in maintaining his aircraft. His squadron members looked up to him with high esteem and often said, "He had nerves of steel in a tight situation." To be a veteran combat pilot, you have to have

THE DECK

a huge amount of luck or be doing something right.

When Major McGuire gave advice, his men accepted it as gospel. He had three very important cardinal rules:

■ Never attempt combat at a low altitude.

■ Never let your airspeed fall below 300 MPH when engaging Zeros (the Japanese Zero was more maneuverable than the P-38, but at high speeds, its ailerons became hard to move).

■ Never keep your wing tanks when engaging the enemy in combat.

Major McGuire had always been eight kills behind Major Bong, the leading ace in the Pacific, and this is our first ingredient in a recipe for a mishap — FRUSTRATION.

Living conditions were poor, with various jungle illnesses like malaria, dysentery, and improper diet; all contributing to less than optimum environmental conditions — PHYSIOLOGICAL FACTORS.

When Major Bong had completed 146 combat missions, 400 flying hours, and 40 kills, General Hap Arnold ordered him home for a hero's welcome as America's number one ace in the Pacific Theater. With the competition going home, McGuire started flying to catch up and beat the all-time score, from sunup until sundown — fly, fly, fly — FATIGUE.

After racking up 38 kills with only 2 more to go to tie the high score, McGuire was grounded by General Kenney because he said, "He needed a rest." This is one of the most crucial turning points in the story, because McGuire agreed and knew the General was right.

The real reason had been that it would have looked bad for the Army, Major Bong, and America to receive the number one ace as number two. McGuire was stunned — ANGER.

After Bong received his reception, McGuire was released for flying duty with only two more kills to go! — APPREHENSION.

Everyone was counting on him; his crew, his squadron, and his friends — PEER PRESSURE.

The next mission was four P-38s on a routine patrol with two combat veterans — Major McGuire and Major Rittmayer — plus two new pilots to break in and train in the art of staying alive. Suddenly, below them, they observed one lone Zero, and all four aircraft rolled in on it. But the order to drop the external fuel tanks was not given. Did McGuire forget? Let's look at his reasoning not to jettison the tanks.

■ A 4 to 1 ratio.

■ The P-38s had the altitude and the element of surprise.

■ The operating radius had been increasing to find the enemy. If the fuel tanks were dropped now, they would have to return to base. They had just started out on patrol, plus it was only a single enemy aircraft (a perfectly logical choice at the time).

The four P-38s jumped the Zero and went into a Luffberry circle (a WW I maneuver where each man covers the other's tail in a circle). But, the Zero was inside the circle, sort of a cat-and-mouse game — OVERCONFIDENCE.

Unknown to the Americans, the lone Zero pilot wasn't just your average Japanese aviator, but Shoichi Sugita, the second highest ace in Japan with 80 kills (McGuire's counterpart). Sugita dropped lower and lower until they were about 200 feet above the jungle trees. He then performed an unbelievably tight turn and got on the tail of Major Rittmayer, who started calling to McGuire for help! Things were happening fast and McGuire reacted — MOTOR BEHAVIOR.

Without thinking, he responded and tried to save Rittmayer by turning his aircraft around in a tight, steep vertical bank . . . The P-38 shuddered and dove into the jungle below. With expert skill, Major McGuire righted the stalled aircraft, but it was too late, and the Lightning mushed into the ground, and 700 gallons of high octane fuel erupted into a fireball.

In the fury of the battle, the Zero dove into a valley and escaped. The two new pilots headed for home, horrified. One combat veteran was shot down, and the second highest ace wasn't shot down by an enemy aircraft, but lost to a series of human factors. Major McGuire violated not one, but all three of his rules.

This is a classic example of "loading the gun, stacking the deck," or call it what you may. If the sequence of events isn't broken by you or someone else, the outcome can be disastrous.

This article was not written to discredit Major McGuire, who will always be one of the heroes of WW II. Rather, the intent is to show that even the best of us is human and subject to fatal mistakes. ■

REX RILEY is alive and well

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ Lieutenant Colonel Rex Riley is alive and well! One of the Air Force's chief supporters of safety has returned to full-time duties after a brief stint in a rather low visibility assignment.

Since his return, Lt Col Riley has qualified in the A-7, T-38, F-16, and requalified in the C-141. In addition, Lt Col Riley is ACM qualified in the C-5, C-130, C-9, C-21, C-12, KC-135, KC-10, B-52, B-1, and all Air Force helicopters.

As most of our "old timers" remember, Lt Col Rex Riley has been around since the early 1950s, and his main duty was to recognize Air Force installations which provide outstanding service and facilities to transient aircrews. Although his program has enjoyed several different names over the years, the program has survived and still serves as a mark of distinction for Air Force airfields throughout the world. Lt Col Riley's goal is mishap prevention through the recognition of USAF transient services.

Philosophy

Lt Col Riley and his staff feel that one of the mainstays of any installation aircraft mishap program is the facilities that are used by transient aircrews. Not only are they interested in the obvious flightline hazards and operations, but they attempt to evaluate and improve facilities which could be classed as irritants. These include flight planning, messing, transporting, billeting, and other areas which could directly, or indirectly, affect aircrew frame-of-mind or fatigue levels. In short, they target to seek out and bring attention to any condition which could increase the probability of a mishap.

Transient aircrews may not be familiar with local weather patterns. Therefore, a comprehensive weather briefing that includes local peculiarities is particularly important.

Award Eligibility

As a minimum, bases must meet the following criteria to be eligible for evaluation under the Rex Riley Transient Services Award Program.

- Be an active USAF, AFRES, or ANG (AF) installation, listed in the *IFR Supplement* as possessing facilities to serve transient aircraft and crews.
- Maintain available hours to transients of a minimum of 8 hours per day and 5 days per week.
- Have no continuing official business only (OBO) or other major limitations to transient aircrew arrival or service. (NOTE: Prior permission required (PPR) status is not an automatic ineligibility factor. Many installations are using PPR as a valid management/sequencing tool. A permanent PPR restriction will be evaluated by the Rex Riley program director for determination of eligibility.)

Bag drags are never fun. Timely transportation large enough to carry all crewmembers plus their equipment and baggage will eliminate one source of stress for transient crews.

Administration

The award program is administered by Lt Col Riley and his staff who are assigned to the Flight Safety Division of the Air Force Inspection and Safety Center. Although not a formal IG-type inspection, the evaluations are carried out on a no-notice basis using extensive checklists. Evaluators look at Base Ops facilities, billeting, availability of meals and transport, and transient servicing and maintenance. The goal is to visit/revisit every Air Force base serving transient aircrews within recurring 2-year periods.

Entitlements

Units selected for the Rex Riley Transient Services Award will be added to the award lists published in *Flying Safety* magazine. They will remain on the list and move upward as seniority is increased.

In addition, a certificate suitable for Base Ops display will be forwarded to the commander of the unit responsible for airfield management. (Mini-certificates for other base agencies are available from "Rex" upon request.)

Transient alert people are authorized to wear Rex Riley patches at the unit commander's discretion. Standardized design is provided, but units are responsible for the local procurement and expense of the patches should they be desired. (MAJCOM approval and guidance should also be published in the command supplement to AFR 35-10, *Dress and Personal Appearance of Air Force Personnel.)*

Base operations is the hub around which the mission revolves. Well-laid-out facilities, up-to-date materials, and helpful, knowledgeable people are a winning combination.

Removal

Bases having the award removed will receive a letter of explanation, and the base's name will be deleted from the next list published. Removal will result from:

- An unsatisfactory evaluation.
- The advent of continuing or permanent restrictions published by a base which severely limit the availability of services to transients (as determined by the Rex Riley program director).
- Transient Alert people are involved in a mishap or allow a safety of flight item to go uncorrected.

Trip Reports

Post evaluation trip reports will appear under "X-Country Notes" in *Flying Safety* magazine and will acknowledge the excellent services received at our bases while anonymously reporting the failures of others.

By the time you read this, Lt Col Riley and his staff will have visited the PACAF, the southeast CONUS, and the Far East. They will look like any other crewmembers, indistinguishable from the rest. Hopefully, their evaluation will result in the acknowledgement of your base in an upcoming issue of this magazine.

X-Country Notes

Base Z

Overall services were judged satisfactory; however shortfalls in flightline service, transportation, and weather service prevented "Rex" from acknowledging this base by name. In spite of PPR restrictions, TA was not able to handle the *scheduled*, early-morning departures. Transportation could not provide a bus to handle the 23 crewmembers without some crewmembers having to sit on the floor during the trip to and from off-base quarters. Finally, the weather briefer did not appear familiar with the location of destination bases and the route of flight, and omitted departure station weather from his "–1" briefing. ■

THE

REX RILEY
Transient Services Award

LORING AFB	Limestone, ME*
McCLELLAN AFB	Sacramento, CA
MAXWELL AFB	Montgomery, AL
SCOTT AFB	Belleville, IL
McCHORD AFB	Tacoma, WA
MYRTLE BEACH AFB	Myrtle Beach, SC
MATHER AFB	Sacramento, CA
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, TX
MARCH AFB	Riverside, CA
GRISSOM AFB	Peru, IN
CANNON AFB	Clovis, NM
RANDOLPH AFB	San Antonio, TX
ROBINS AFB	Warner Robins, GA
HILL AFB	Ogden, UT
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, NC
KADENA AB	Japan
ELMENDORF AFB	Anchorage, AK
SHAW AFB	Sumter, SC
LITTLE ROCK AFB	Jacksonville, AR
OFFUTT AFB	Omaha, NE
KIRTLAND AFB	Albuquerque, NM
BUCKLEY ANG BASE	Aurora, CO
RAF MILDENHALL	UK
WRIGHT-PATTERSON AFB	Fairborn, OH
POPE AFB	Fayetteville, NC
TINKER AFB	Oklahoma City, OK
DOVER AFB	Dover, DE
GRIFFISS AFB	Rome, NY
KI SAWYER AFB	Gwinn, MI
REESE AFB	Lubbock, TX
VANCE AFB	Enid, OK
LAUGHLIN AFB	Del Rio, TX
FAIRCHILD AFB	Spokane, WA
MINOT AFB	Minot, ND
VANDENBERG AFB	Lompoc, CA
ANDREWS AFB	Camp Springs, MD
PLATTSBURGH AFB	Plattsburgh, NY
MACDILL AFB	Tampa, FL
COLUMBUS AFB	Columbus, MS
PATRICK AFB	Cocoa Beach, FL
WURTSMITH AFB	Oscoda, MI
WILLIAMS AFB	Chandler, AZ
WESTOVER AFB	Chicopee Falls, MA
ELGIN AFB	Valparaiso, FL
RAF BENTWATERS	UK
RAF UPPER HEYFORD	UK
ANDERSON AFB	Guam
HOLLOMAN AFB	Alamogordo, NM
DYESS AFB	Abilene, TX
AVIANO AB	Italy
BITBURG AB	Germany
KEESLER AFB	Biloxi, MS
HOWARD AFB	Panama
GEORGE AFB	Victorville, CA
PETERSON AFB	Colorado Springs, CO
CLARK AB	Philippines
MOODY AFB	Valdosta, GA
RHEIN-MAIN AB	Germany
RAF LAKENHEATH	UK
ZARAGOZA AB	Spain
TORREJON AB	Spain
LUKE AFB	Glendale, AZ
BLYTHEVILLE AFB	Blytheville, AR
NELLIS AFB	Las Vegas, NV
BERGSTROM AFB	Austin, TX
DAVIS-MONTHAN AFB	Tucson, AZ
ZWEIBRUCKEN AB	Germany
HAHN AB	Germany
KUNSAN AB	Korea
RAMSTEIN AB	Germany
JOHNSTON ATOLL	JQ
WAKE ISLAND	WQ

*Rex Riley list arranged in order of award date

Smoke tests such as this revealed some serious deficiencies in the earlier smoke goggles and quick-don oxygen mask combination.

SMOKE GOGGLES: FRIEND OR FOE?

CAPTAIN BEN RICH
Directorate of Aerospace Safety

■ All C-141, C-130, and C-5 cockpit crewmembers have seen the introduction of the new blue smoke goggles (Pt. No. 322-70) designed to operate with the quick-don oxygen mask (Pt. No. 358-1506V). While most have also had the opportunity to train with these aids in the simulator, very few have been forced to use this equipment under actual emergency conditions. A Dover AFB C-5 crew recently joined the "few," and their experience provides us with some lessons.

The local C-5 training mission was en route to another airport for transition work when the crew encountered fumes, later found to be coming from a faulty air-conditioning unit. The crew donned oxygen masks and goggles and initiated a return to Dover.

Our C-5 crew found the mask and goggle combination adequate in protecting them from the fumes, but they also found the goggles generated additional problems.

Three of the crew experienced fogging of one of their lenses. They were unable to clear the visual obstruction without taking off the goggles and physically wiping out the fog. The goggle ventilation capability failed to clear the fog.

The pilots experienced additional problems which could have a severe impact under certain conditions. They found their peripheral vision was greatly reduced, forcing exaggerated head movement for even routine activities. Simulator training missions, during which the goggle/mask combination is used, fail to show the severity of this problem because simulators lack sideways visual capability, and aircrews accept the simulator as a facsimile of the real aircraft. In the aircraft, we use the side windows.

Our C-5 crew was able to maintain visual conditions and used the earth, our largest attitude indicator, for reference. The exaggerated head movement could really have been a problem had the crew been in instrument conditions as the scenario was ripe for vertigo — a problem rarely found in transport-type aircraft.

Aircrews need to remain aware that if they need to use the mask and goggle combination (or the chemical warfare mask — Pt. No. 651-472-1), they will also have to combat the vision restrictions associated with this equipment. ■

The new blue smoke goggles are a big improvement, but some problems still exist.

The Emergency Escape Breathing Device provides eye protection and approximately 15 minutes of oxygen.

FSO's CORNER

Deployment Safety Briefing

CAPTAIN DALE T. PIERCE
919th Special Operations Group
Eglin AFB Aux Fld 3, Florida

■ 1. When was the last time you were called upon as an FSO to give a deployment safety briefing?

2. How much notice were you given?

3. What did you use to organize your briefing?

4. In retrospect, did you cover all the areas you should have?

5. Did you tell yourself there had to be a better way?

6. Did you promise yourself you would do it better next time?

7. Sound familiar?

I'm sure at least one FSO out there could answer the above questions (1) recently, (2) very little, (3) best guess, (4) no, (5) yes, (6) repeatedly, and (7) definitely. If you're that FSO, this one's for you.

Last October, while I was TDY to Bitburg Air Base in West Germany, I had the opportunity to talk to Captain Mark D. Peterson. He was then the FSO at the 53d Tactical Fighter Squadron. As we talked about his program, he told me about some problems he'd encountered with short notice taskings for deployment briefings.

He proceeded to tell me about the deployment briefing guide he developed and how it had helped him to respond to those short notice taskings with a professional product. He also told me that he'd carried the idea a step further and used it to develop specific briefing guides for their regular deployment locations. I have included his briefing guide as an example.

53d TFS Deployment Briefing Guide

1. ROTE

a. Circadian rhythm for long ROTEs.

b. Packing bay 5, travel pod ops limits.

c. Review divert fields, simulator practice.

d. International controllers.

e. Bingos for AAR.

f. Over mountain/mountain flight.

g. Inflight fatigue.

h. En route WX/NOTAMS update.

i. Arrival field characteristics.

2. GROUND OPERATIONS

a. Taxi routes.

b. Arm/dearm procedures.

c. Hot brakes.

d. Barriers.

e. Runways — slope, number, length, width.

f. Ramp operations.

3. SIDs

a. Noise abatement.

b. Minimum safe altitudes.

c. Traffic conflict areas.

d. Radar services available.

4. LOCAL HAZARDS

a. Birds.

b. Sport flying.

c. Restricted airspace.

d. MIJI.

e. Local survival — water, desert, polar.

f. Emergency services — fire, rescue.

g. Language differences.

h. Multinational ROE/opponents.

5. LOCAL BINGOS

a. Alternates.

b. Emergency airfields.

6. RECOVERY

a. Approaches.

b. Minimum safe altitudes.

c. VFR pattern procedures.

d. Traffic conflict areas.

e. Radar services available.

7. OFF-DUTY HAZARDS

a. Driving.

b. Alcohol.

c. The sun.

d. Water sports — scuba, skiing, swimming.

e. Other sports.

f. Crime areas.

g. Terrorist threat.

The FSO's Corner needs your ideas. What are you doing in your program that could help other FSOs if they knew about it? If you are doing something unusual with your program or have found a better way to fill the squares, call me (Dale Pierce) at AUTOVON 579-7450 (SMOTEC) or send your name, AUTOVON number, and a brief description of your program idea to 919 SOG/SEF, Eglin AFB Aux Fld 3, FL 32542-6005. ■

MAINTENANCE *Matters*

CROSSED HYDRAULIC LINES

■ Upon left engine shutdown from a routine sortie and with the right engine still operating, the A-10A pilot noticed the ailerons beginning to stiffen and then freeze as the hydraulic pressure bled off. After a short period of troubleshooting, the crew chief discovered the flexible teflon pressure and return lines of the right hydraulic system were crossed at the aileron actuator.

The investigation revealed the aircraft previously had a time compliance technical order (TCTO) accomplished during phase maintenance. For easier accomplishment of the TCTO, a pneudraulic shop technician disconnected the flexible pressure and return hydraulic lines which connect the left aileron actuator to the aircraft's steel hydraulic lines. The odd thing here is both the pressure and return hydraulic line fittings are the same size.

Once the TCTO was completed, the pneudraulic shop dispatched a different specialist, along with a trainee, to reconnect the hydraulic lines. At the aircraft, the specialist wanted to perform additional phase maintenance, so he directed the trainee to reconnect the lines. Although he was questioned by the trainee about the possibility of reconnecting the lines in reverse, the specialist, with little A-10 experience, informed him that a reverse connection was impossible. The specialist, who had not yet attended the A-10 field training detachment (FTD) course, based his decision on previous experience with other aircraft. He then pointed out the pressure and return lines on the aircraft side for the trainee who connected the lines without further questioning. Once the lines were reconnected, the specialist inspected them for chafing and tightness and then signed the "corrected by" block of AFTO Form 781A.

In the "corrected by" block of the forms, the pneudraulic specialist indicated an operational and pressure check were due, and gave the page number and block where this writeup could be found. Yet when he transferred this writeup to the next page, it indicated leak and pressure checks were due, but didn't specify the need for an operational check.

After phase maintenance, the leak and pressure checks were performed with both engines operating, yet no discrepancies were

found at this time. In fact, the aircraft had actually flown seven sorties with the crossed hydraulic lines prior to discovery.

Even though the fittings are the same size, TO 1A-10A-2-27JG-5 addresses the possibility of a crossover occurring in a note located in the "Remove and Install Actuator" section. The note directs the specialist to tag hoses and tubing prior to removal to ensure proper installation.

Since our pneudraulic specialist in this potential mishap was not removing or installing the aileron actuator, he didn't use that section of the job guide. When the different pneudraulic specialist arrived to reconnect the lines, he was convinced they could not be connected in reverse. Even if they were crossed, he felt an operational check would catch the error prior to flight.

The fact is an operational check of the A-10 roll flight control system involves an extensive 46-page checklist which is not normally accomplished for a hydraulic line disconnect/reconnect. Rather, this extensive check is used when an actuator is replaced or an adjustment to rigging is required. The normal operational check for the type maintenance performed during this TCTO involved applying power to both hydraulic systems, checking for leaks and correct pressure, and bleeding the system if required.

Even though the operational check was omitted from the AFTO Form 781A, it would have made no difference in this case. The aircraft was able to fly the seven sorties with the lines crossed most probably because the pilots were not allowing the left hydraulic pressure to bleed down sufficiently prior to doing a flight controls check during normal engine shutdown. Roll response/control is the same with one or both hydraulic systems operating. In-flight everything would have been normal as long as the left hydraulic system was pressurized. A flight control check during normal engine start would not have caught the problem since the left system was connected correctly, and the left engine is normally started first.

This particular unit is working with the depot to install different size fittings on the flexible teflon hydraulic lines and to develop an additional operational check of the flight controls, powering one system at a time, following any hydraulic maintenance which disrupts system integrity. In the interim, their A-10 maintainers are marking the pressure and return lines accordingly.

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

CAPTAIN

John E. Churchill

FIRST LIEUTENANT

John I. Reed

20th Tactical Fighter Wing

■ On 5 June 1986, Captain John E. Churchill, Aircraft Commander, and First Lieutenant John I. Reed, Weapons System Officer, were returning to base after leading a two-ship F-111, low level mission. Following a formation low approach to their overseas base, Captain Churchill cleared his wingman off for a full stop and remained in the local pattern. With 4,000 pounds of fuel remaining, he called for a closed full stop.

Immediately after rolling out on final at 300 feet and 140 KIAS, the aircraft experienced an abrupt pitchdown to approximately 15 degrees nose low. Captain Churchill countered with aft stick requiring in excess of 50 pounds of force. Approximately one second later, the stick instantly repositioned to full aft. The nose pitched up to 20 degrees nose high, and the aircraft began to stall.

With airspeed quickly bleeding off and the stall warning horn on, Captain Churchill initiated full afterburner and advised Lieutenant Reed to prepare for ejection. Captain Churchill, using both hands, was able to lower the nose to the horizon but had to forcefully counter several pitchups and pitchdowns. The aircraft continued to exhibit the textbook characteristics of a stall — nose yaw and wing rock. As the aircraft slowly accelerated, Lieutenant Reed directed Captain Churchill to raise the gear, turn off the pitch damper, and engage the flight control disconnect switch.

Oscillations began to decrease and the aircraft rapidly accelerated. Below emergency fuel of 2,000 pounds, Captain Churchill quickly coordinated intentions with the SOF, and Lieutenant Reed initiated emergency procedures checklist items. A quick controllability check was performed, and the crew set up for an approach end cable engagement which was uneventful. The quick reactions, superior airmanship, and exceptional crew coordination demonstrated by Captain Churchill and Lieutenant Reed resulted in the safe recovery of a valuable combat crew and aircraft. WELL DONE! ■

UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

CAPTAIN

Vincent C. Boudreaux

730th Tactical Fighter Squadron

■ Captain Boudreaux was leading a 3-ship F-16 flight on 10 July 1986. While accomplishing a bomb check at 1,000 feet and 325 knots after a first run tactical attack, his aircraft was jolted by a violent engine stall, followed by grinding of metal parts which resulted in RPM rollback and engine flameout.

He jettisoned the centerline fuel tank and started the jet fuel starter while zooming the aircraft to 2,200 feet and 170 knots. Due to the catastrophic nature of the engine failure, he thought an ejection would be necessary and steered the aircraft away from several towns in the vicinity. Captain Boudreaux attempted one air start prior to ejection. The engine started and began providing usable, but degraded thrust at approximately 1,200 feet, and he regained level flight at 700 feet.

The nearest emergency field was 14 miles away, but Captain Boudreaux chose not to recover there because it would have required overflying a large populated area, and he considered a second engine failure and ultimate ejection probable. Instead, he climbed to 2,500 feet under a 3,000 foot overcast and accomplished an uneventful opposite direction landing at his home field 20 miles away.

Captain Boudreaux's ability to function in an extremely stressful situation, combined with superb airmanship, averted possible loss of life and prevented the loss of a valuable combat aircraft. WELL DONE! ■

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UNITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Mishap Prevention Program.

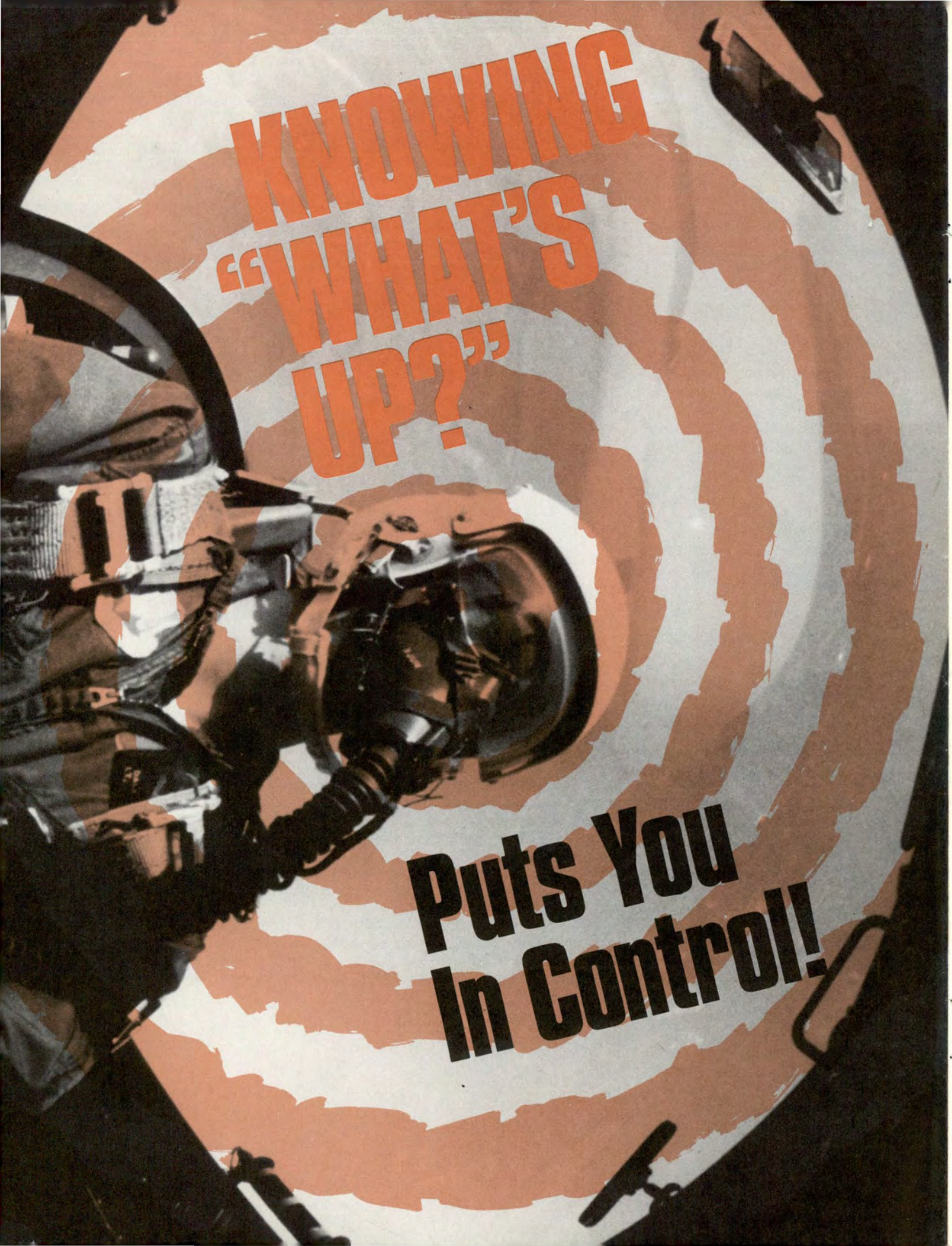
TECHNICAL SERGEANT

Alvin D. McQuitty

40th Tactical Group

■ On 23 June 1986, Sergeant McQuitty was launching an F-111 when a massive fire erupted in the engine bay during engine start. Upon seeing the fire, he immediately ordered the aircrew to shut down the engine and emergency ground egress from the aircraft. He ran to fight the fire with a fire bottle and told another person to call for a fire truck. At the same time, he ordered everyone out of the shelter where the aircraft was parked. The fire was limited to residual fuel in the engine bay and was extinguished with no damage to the aircraft.

Without question, Sergeant McQuitty's quick thinking and decisive actions, despite the danger he was exposed to, helped prevent a potential catastrophe involving the possible loss of a multimillion dollar aircraft and, more importantly, the loss of human life. WELL DONE! ■


KNOWING "WHAT'S UP?"
Puts You In Control!